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USER MANUAL

S203TA-D

S203RC-D

Advanced Energy Analizers

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Date	Revision	Notes
17/04/2013	6	Complete manual rewrite
03/05/2013	7	Add command registers info
23/05/2013	8	Add new feature from firmware SW002632: backup of last screen page displayed
27/06/2013	9	Changed the Current Modbus registers (phase A,B,C) measure unit from [Arms] to [mA rms] Changed Phase Voltage error level from 40.0V to 45.0V (firmware SW002633)

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1. Introduction

Models S203TA-D and S203RC-D are a complete three-phase energy analyzers with display, suited for use with up to 600Vac voltage range (without a TV transformer), and max current equal to 5A (without a TA transformer) connected to the inputs. A double serial interface (USB or RS485) it's also available (Modbus RTU protocol).
Analog and digital outputs can be connected to the electrical measure.

1.1. Features

- Energy values backup (FeRAM backup values without battery need)
- Last screen page displayed backup (FeRAM backup without battery need)
- Easy configurable by free configuration software or by display menù
- RS485 serial communication with MODBUS-RTU protocol, maximum 32 nodes.
- USB serial communication with Modbus RTU protocol for registers access and configuration
- High precision: 0,2%class (S203TA-D).
- Protection against ESD discharge up to 4 kV.
- Measure input insulation: 4000 Vac towards all the other circuits.
- Insulation between communication and power supply: 1500Vac.
- Insulation between retransmitted output and power supply: 1500Vac.
- Analog output signal settable in voltage or current.
- Digital output pulse signal for Energy or Energy sign.
- Possibility for connection and management by external CTs with 5A output.
- Possibility for connection and management by external VTs.
- All kind of insertion possible: single phase, Aron, 4-wires, 3-wires .
- Possibility to compensate errors caused by frequency change in places where network frequency is not stable (frequency changes > 30 mHz).
- USB Firmware update
- Easy-wiring of power supply and serial bus by means of the bus housed in the DIN rail.

1.2. Electrical Measure on Display

The instruments provide all the following electrical measurable quantities by the display:

- V RMS (phase A to neutral)
- V RMS (phase B to neutral)
- V RMS (phase C to neutral)
- V RMS 3-phase
- I RMS phase A
- I RMS phase B
- I RMS phase C
- I RMS 3-phase
- P ACTIVE phase A
- P ACTIVE phase B
- P ACTIVE phase C
- P ACTIVE 3-phase
- Q reactive phase A
- Q reactive phase B
- Q reactive phase C
- Q reactive 3-phase
- S apparent phase A
- S apparent phase B
- S apparent phase C

- S apparent 3-phase
- Cosfi phase A
- Cosfi phase B
- Cosfi phase C
- Cosfi 3-phase
- Active Energy phase A
- Active Energy phase B
- Active Energy phase C
- Active Energy 3-phase
- Only positive Active Energy 3-phase
- Only negative Active Energy 3-phase
- Phase A frequency

1.3. Electrical Measure on Modbus RTU Interface

By the serial RS485 or USB (Modbus RTU Protocol) the following electrical measurable quantities are available:

- V RMS (phase A to neutral)
- V RMS (phase B to neutral)
- V RMS (phase C to neutral)
- V RMS 3-phase
- I RMS phase A
- I RMS phase B
- I RMS phase C
- I RMS 3-phase
- P ACTIVE phase A
- P ACTIVE phase B
- P ACTIVE phase C
- P ACTIVE 3-phase
- Q reactive phase A
- Q reactive phase B
- Q reactive phase C
- Q reactive 3-phase
- S apparent phase A
- S apparent phase B
- S apparent phase C
- S apparent 3-phase
- Cosfi phase A
- Cosfi phase B
- Cosfi phase C
- Cosfi 3-phase
- Active Energy phase A
- Active Energy phase B
- Active Energy phase C
- Active Energy 3-phase
- Only positive Energy phase A
- Only positive Energy phase B
- Only positive Energy phase C
- Only positive Active Energy 3-phase
- Only negative Energy phase A
- Only negative Energy phase B

- Only negative Energy phase C
- Only negative Active Energy 3-phase
- Phase A frequency

1.4. Electrical Measure on Analog Output

The modules can put to the analog output (configurable in current 0-20 mA, 4-20 mA or voltage 0-10 V) one of the following electrical measurable quantities :

- V RMS (phase A to neutral)
- V RMS (phase B to neutral)
- V RMS (phase C to neutral)
- V RMS 3-phase
- I RMS phase A
- I RMS phase B
- I RMS phase C
- I RMS 3-phase
- P ACTIVE phase A
- P ACTIVE phase B
- P ACTIVE phase C
- P ACTIVE 3-phase
- Cosfi phase A
- Cosfi phase B
- Cosfi phase C
- Cosfi 3-phase

1.5. Electrical Measure on Digital Output

The modules can put to the digital output (pulse weight configurable) one of the following electrical measurable quantities :

- Positive Energy phase A
- Positive Energy phase B
- Positive Energy phase C
- Negative Energy phase A
- Negative Energy phase B
- Negative Energy phase C
- 3-phase only positive Energy
- 3-phase only negative Energy

1.6. S203TA-D Insertion types

The following insertion types are possible (CT = current transformer, VT = voltage transformer):

- Single phase insertion
- Single phase insertion with CT
- Single phase insertion with VT
- Single phase insertion with CT and VT
- Aron insertion with CTs
- Aron insertion with CTs and VTs
- 3-phase insertion with neutral with CTs
- 3-phase insertion without neutral with CTs
- 3-phase insertion without neutral with CTs and VTs

WARNING!

ARON insertion without CTs it's not allowed (two phases are short circuited!)
3-PHASE insertion without CTs it's not allowed (the phases are short circuited!)

1.7. S203RC-D Insertion types

- Single phase insertion
- Single phase insertion with VT
- Aron insertion
- Aron insertion with VTs
- 3-phase insertion with neutral
- 3-phase insertion with neutral with VTs
- 3-phase insertion without neutral
- 3-phase insertion without neutral with VTs

2. S203TA-D Electrical Connections

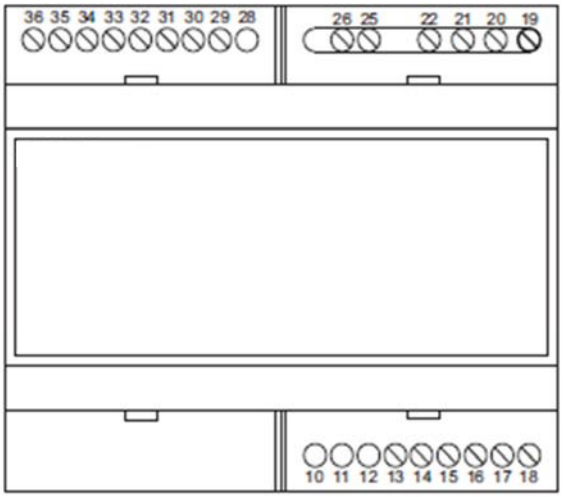
DANGER!

Never open the secondary circuit of CT under applying current to load.
Never remove the terminal block under applying current to load, will cause electric shock or breakdown CT

WARNING!

- ***ARON insertion without CTs it's not allowed (two phases are short circuited!)***
- ***3-PHASE insertion without CTs it's not allowed (the phases are short circuited!)***
- ***You can't connect the secondary of any CTs to the Earth.***
- ***Terminals 14, 16 18 and 22 are internally connected!***
- ***Use CT with the secondary side current is 5A***
- ***All CTs connected should be the same.***
- ***When connecting CT, connect the secondary side to the terminal of the main unit first, and after that wire the primary side to a load electric wire. Incorrect order might cause an electric shock or break CT.***
- ***The CT has polarity. Wrong direction can't measure correctly (for example negative current value instead of positive)***
- ***If there is some distortion by harmonic or waveform, it may not measure correctly.***
- ***Separate the wiring (strong electric part) of the measured voltage input terminal (operating power supply terminal) from the CT cable. It may not satisfy the accuracy due to noise.***
- ***Current Terminals Max 5A, Voltage Terminals Max 600V***

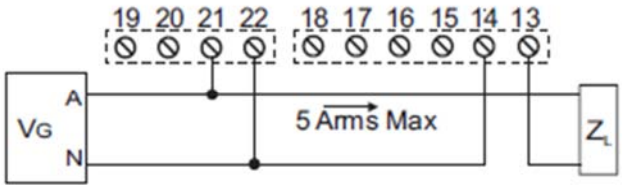
2.1. S203 TA-D Terminal Positions



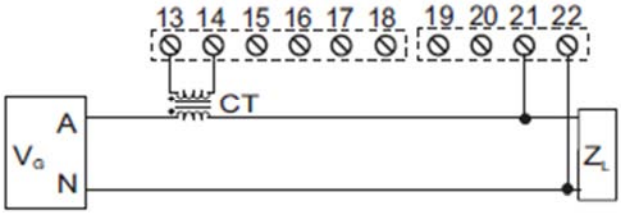
2.2. Single phase insertion

WARNING!

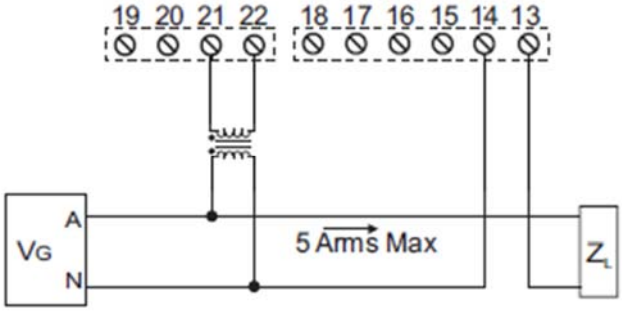
Pay attention to the different terminals positions in this schematics:



2.3. Single phase insertion with CT

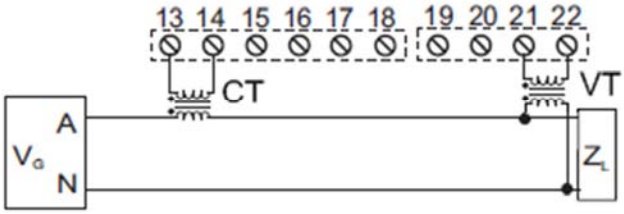


2.4. Single phase insertion with VT



I MAX = 5 A

2.5. Single phase insertion with CT and VT



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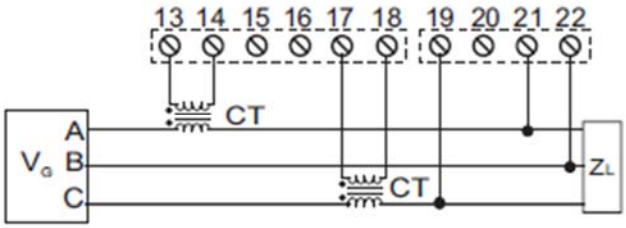
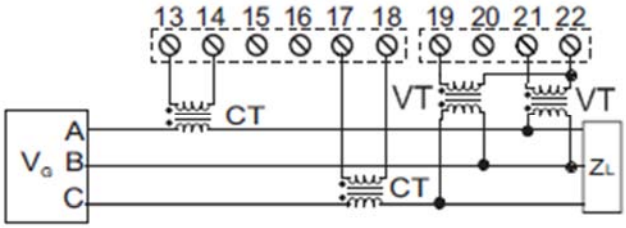
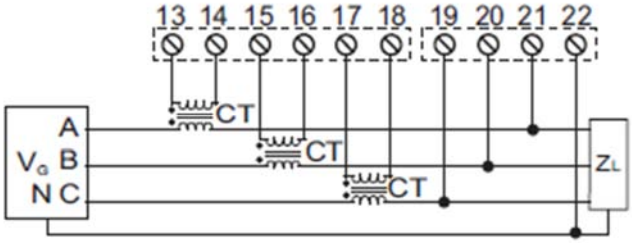
2.6. Aron insertion with CTs



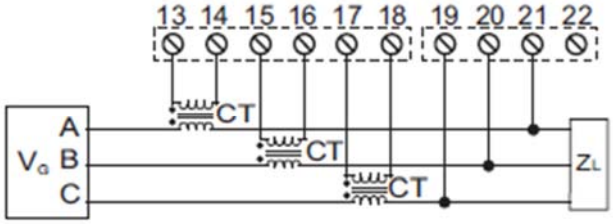
2.7. Aron insertion with CTs and VTs



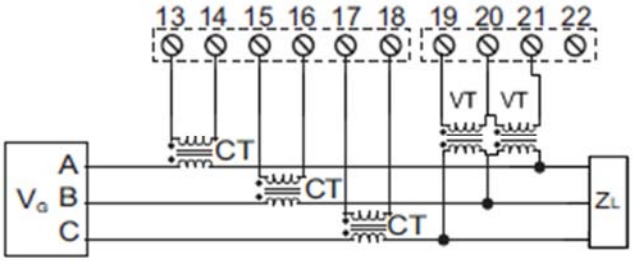
2.8. 4 wire with neutral insertion with CTs



2.9. 3-phase without neutral insertion with CTs



2.10. 3-phase without neutral insertion with CTs and VTs



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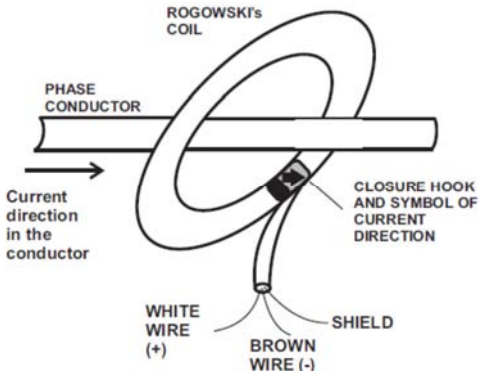
3. S203RC-D Electrical Connections

ROGOWSKI'S COIL WARNING!

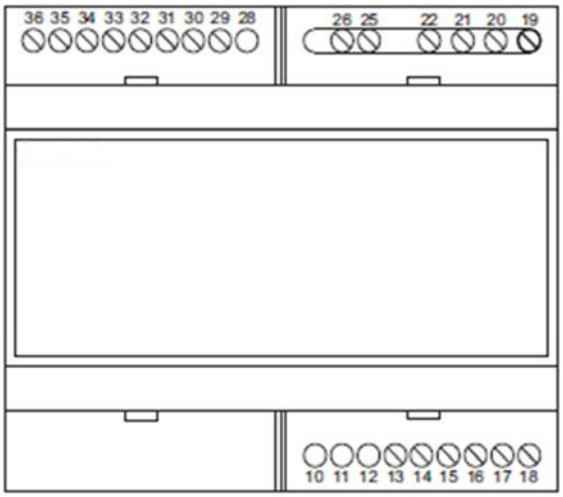


Rogowski's coil (accessory RC-V400-100) have been designed for accurate nonintrusive measurement of AC, pulsed DC or complex waveforms.
To use in an appropriate way,
- wrap the ring on the conductor so that the arrow symbol (stamped in the ring) is oriented in the same direction of the current in the conductor
- make sure that the connections are performed properly: the white output wire is positive (+), the brown wire is the negative (-).

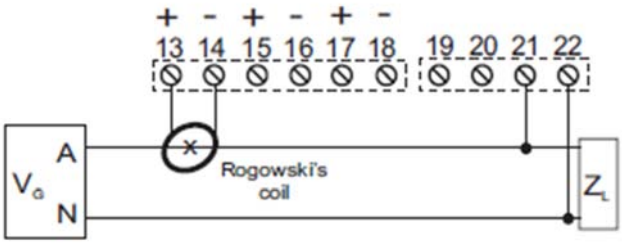
WARNING!

- ***Connect the shield of the Rogowski's coil at negative (-) (one of the terminals 14 or 16 or 18 or 22).***
- ***Terminals 14, 16 18 and 22 are internally connected***
- ***Voltage Terminals Max 600V***
- ***The Rogowski has polarity. Wrong direction can't measure correctly (for example negative current value instead of positive)***
- ***If there is some distortion by harmonic or waveform, it may not measure correctly.***
- ***Separate the wiring (strong electric part) of the measured voltage input terminal (operating power supply terminal) from the CT cable. It may not satisfy the accuracy due to noise.***

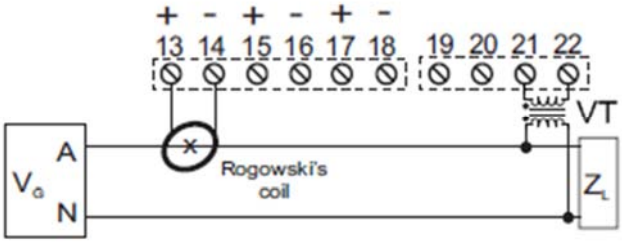
3.1. S203 RC-D Terminal Positions



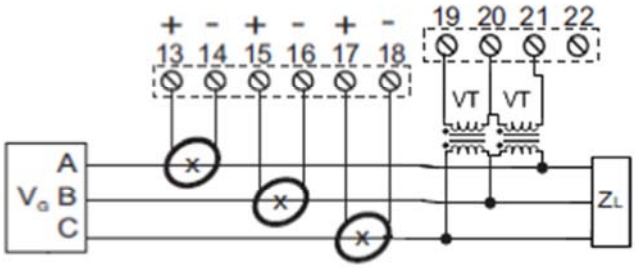
3.2. Single phase insertion



3.3. Single phase insertion with VT



3.4. Aron insertion



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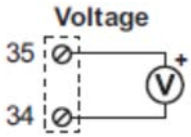
4. Analog Output

The module provides a programmable, analog output in voltage (range 0..10 Vdc) or active and passive current (range 0..20 mA).
We recommend using shielded cables for the electric connections.

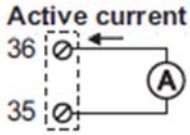
WARNING

There is no insulation between RS485, USB and the analog output

4.1. Analog Output in voltage mode connections



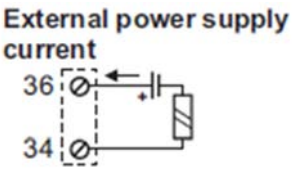
4.2. Analog Output in current active mode connections



4.3. Analog Output in current passive mode connections

WARNING

Vext MAX = 24V DC



5. Digital Output

The module has a digital output: configurable in two different modes:
-Each pulse corresponds to a given number of increments of to the energy counter
-The output is linked to the sign of the Active power

For more informations, see the display menù chapter.

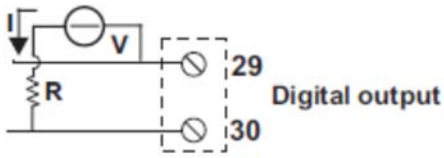
5.1. Digital Output electrical connections

WARNING

The R and V values must follows this equations

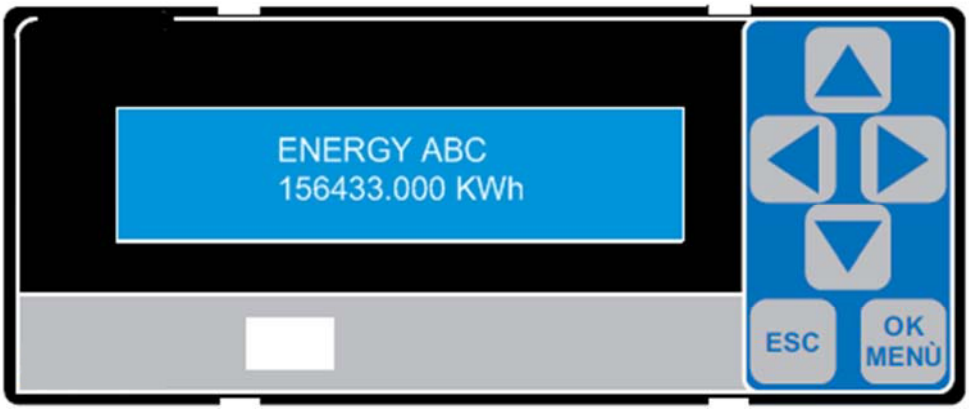
I max=V/R=50 mA

V max= 28V



6. The display

By the display the electrical measures are viewable in real time, also a display configuration menù it's available.



6.1. Electrical symbols on Display

By pressing the button OK/MENU' it's possible to switch to the next measure visualization.

You can return to the previous measures by pressing the ESC button.

When a new page is selected, the page is first saved into the FeRAM and then displayed, so if the module it's switched off and then on the last page displayed it's visualized.

The Measure displayed depends from the insertion type (the following measures are in visualization order):

6.1.1. 4 wires insertion (with or without neutral)

DISPLAY *ELECTRICAL QUANTITY* *SYMBOL*	*COMMENT*	*MEASURED VALUE*	*CALCULATED VALUE*	*EQUATION USED*
VRMS A	V PHASE A RMS Voltage from phase A to NEUTRAL*	X		*For connection without neutral a "virtual neutral" it's used
VRMS B	V PHASE B RMS Voltage from phase B To NEUTRAL*	X		*For connection without neutral a "virtual neutral" it's used

VRMS C	V PHASE C RMS Voltage from phase C To NEUTRAL*	X		*For connection without neutral a “virtual neutral” it’s used
VRMS ABC	V RMS Three phase Voltage		X	$\frac{VrmsA + VrmsB + VrmsC}{3}$
IRMS A	RMS phase A current	X		-
IRMS B	RMS phase B current	X		-
IRMS C	RMS phase C current	X		-
IRMS ABC	RMS Three phase Current		X	$\frac{IrmsA + IrmsB + IrmsC}{3}$
P A	Phase A Active Power	X		-
P B	Phase B Active Power	X		-
P C	Phase C Active Power	X		-
P ABC	Three phase active power		X	$P\ A + P\ B + P\ C$
Q A	Phase A Reactive Power		X	$\sqrt{(S\ A)^2 - (P\ A^2)}$
Q B	Phase B Reactive Power		X	$\sqrt{(S\ B)^2 - (P\ B^2)}$
Q C	Phase C Reactive Power		X	$\sqrt{(S\ C)^2 - (P\ C^2)}$
Q ABC	Three phase reactive power		X	$\frac{Q\ A + Q\ B + Q\ C}{3}$

S A	Phase A Apparent power		X	$VRMS\ A \times IRMS\ A$
S B	Phase B Apparent power		X	$VRMS\ B \times IRMS\ B$
S C	Phase C Apparent power		X	$VRMS\ C \times IRMS\ C$
S ABC	Three phase apparent power		X	$S\ A + S\ B + SC$
COSFI A	Phase A cosΦ		X	$\frac{P\ A}{S\ A}$
COSFI B	Phase B cosΦ		X	$\frac{P\ B}{S\ B}$
COSFI C	Phase C cosΦ		X	$\frac{P\ C}{S\ C}$
COSFI ABC	Three phase cosΦ		X	$\frac{P\ ABC}{S\ ABC}$
ENERGY A	Phase A Active Energy		X	$\int P\ A_i\ dt$
ENERGY B	Phase B Active Energy		X	$\int P\ B_i\ dt$
ENERGY C	Phase C Active Energy		X	$\int P\ C_i\ dt$
ENERGY ABC	Three phase active energy		X	$ENERGY\ A + ENERGY\ B + ENERGY\ C$

POS ENERGY ABC	Three phase only positive active energy		X	$POS\ ENERGY\ A + POS\ ENERGY\ B + POS\ ENERGY\ C$
NEG ENERGY ABC	Three phase only negative active energy		X	$NEG\ ENERGY\ A + NEG\ ENERGY\ B + NEG\ ENERGY\ C$
FREQUENCY	Frequency	X		Measured from phase A

6.1.2. 1 wire insertion

DISPLAY ***ELECTRICAL QUANTITY*** ***SYMBOL***	***COMMENT***	***MEASURED VALUE***	***CALCULATED VALUE***	***EQUATION USED***
VRMS A	V PHASE A RMS Voltage from phase A to NEUTRAL	X		-
IRMS A	RMS phase A current	X		-
P A	Phase A Active Power	X		-
Q A	Phase A Reactive Power		X	$\sqrt{(S\ A)^2 - (P\ A^2)}$
S A	Phase A Apparent power		X	$VRMS\ A \times IRMS\ A$
COSFI A	Phase A cosΦ		X	$\frac{P\ A}{S\ A}$
ENERGY A	Phase A Active Energy		X	$\int P\ A_i\ dt$
POS ENERGY A	One phase only positive active energy		X	$\int P\ A\ (+)_i\ dt$

NEG ENERGY A	One phase only negative active energy		X	$\int P\ A\ (-)_i\ dt$
FREQUENCY	Frequency	X		Measured from phase A

6.1.3. Aron insertion

DISPLAY ***ELECTRICAL QUANTITY*** ***SYMBOL***	***COMMENT***	***MEASURED VALUE***	***CALCULATED VALUE***	***EQUATION USED***
VRMS AC	V AC RMS Voltage from phase A to C	X		-
VRMS BC	V BC RMS Voltage From phase B to C	X		-
IRMS A	RMS phase A current	X		-
IRMS C	RMS phase C current	X		-
P AC	Phase A C Active Power	X		-
P BC	Phase B C Active Power	X		-
P ABC	Three phase active power		X	$P\ AC + P\ BC$
Q ABC	Three phase reactive power		X	$\sqrt{3}\ \times (P\ AC - P\ BC)$
S ABC	Three phase		X	

	apparent power			$\sqrt{3} \times \frac{(S\,A + S\,C)}{2}$
COSFI ABC	Three phase cosΦ		X	$\frac{P\,A + P\,C}{\sqrt{(P\,A + P\,C)^2 + (P\,A - P\,C)^2}}$
ENERGY ABC	Three phase active energy		X	$\int P\,ABC_i\ dt$
POS ENERGY ABC	Three phase only positive active energy		X	$\int P\,ABC\,(+)_i\ dt$
NEG ENERGY ABC	Three phase only negative active energy		X	$\int P\,ABC\,(-)_i\ dt$
FREQUENCY	Frequency	X		Measured from phase A

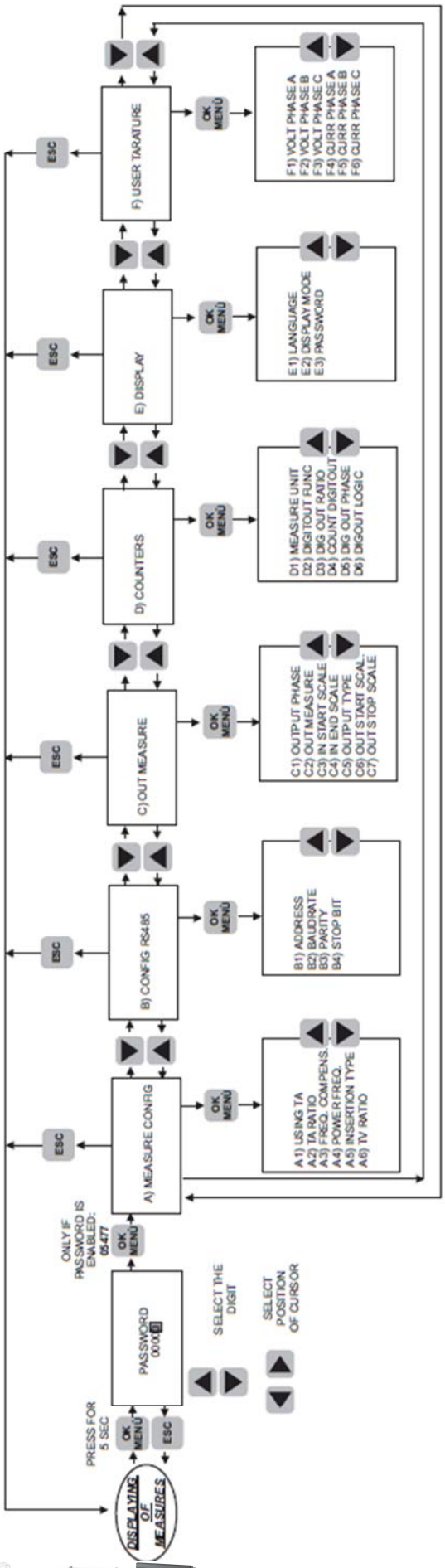
6.2. Display Menù

By the display menù it's possible to setup the S203TA-D / S203RC-D, for a faster configuration you can also use a PC with the free software Easy Setup included with the ítem.

For enter to the Menù press the button OK/Menù for 5 seconds.

6.2.1. Top level menù

By pressing the UP or DOWN menù it's possible to change the parameter to edit, confirm by pressing the OK/MENU' button or ESC button to exit from the menu:



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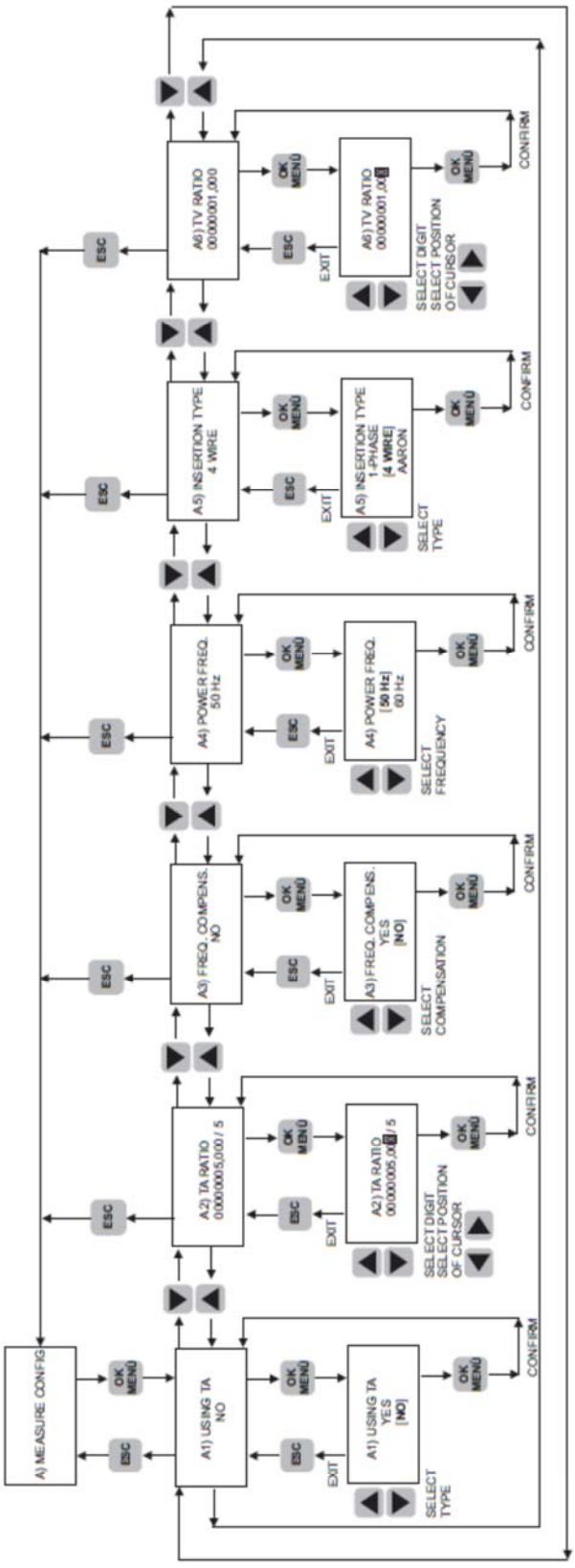
6.2.1. Sub-level menu

From the top menù by pressing OK/MENU' button the parameters can be edit, see this example diagram:



6.2.1. A) Measure config

PARAMETER	VALUES
A1) USING TA	To be used only for S203TA-D model, for S203RC-D model use only NO YES= A Current Transformer it's connected to A, B and C phases NO = No Current transformer used DEFAULT: NO
A2) TA RATIO	Current Transformer ratio value. The transformer secondary it's 5A. Example: for a 100/5 (100:5) Current transformer type 100,000. All current values will be multiplied for a factor of 20. Default: 5,000 (TA 5/5)
A3) FREQUENCY COMPENSATION	YES = The S203TA/RC-D will compensate the frequency fluctuation (use only if the source frequency it's not stable) NO = no frequency fluctuation compensation used Default: NO
A4) POWER FREQUENCY	50 Hz = 50 Hz calibration values will be used (for European 50 Hz power frequency) 60 Hz = 60 Hz calibration values will be used Default: 50Hz
A5) INSERTION TYPE	1-PHASE = For 1 phase insertions 4 WIRE = For 3-phase with or without neutral insertion ARON = For 3-phase Aron insertion Default: 4 WIRE
A6) TV RATIO	Voltage Transformer ratio value.

	If no Voltage Transformer it's used type 1,000. Example: for a 1:100 voltage transformer type 100,000. All voltage values will be multiplied for a factor of 100. Default: 1,000

6.2.1. B) Config RS485

PARAMETER	VALUES
B1) ADDRESS	Modbus RTU station address from 1 to 253 Default: 1
B2) BAUDRATE	Serial RS485 baudrate, can be: 2400 baud 4800 baud 9600 baud 19200 baud 38400 baud 57600 baud 115200 baud Default: 38400 baud
B3) PARITY	Parity bit, can be: NONE ODD EVEN Default: NONE
B4) STOP BIT	Stop bit, can be: 1 stop bit

	2 stop bits Default: 1 stop bit

6.2.1. C) Out Measure

PARAMETER	VALUES
C1) OUTPUT PHASE	Phase to link to the analog output: 3-phase = ABC measure value Phase A = phase A measure Phase B = phase B measure Phase C = phase C measure Default: 3-phase
C2) OUT MEASURE	Measure to link to the analog output: VRMS = Vrms linked to the analog output IRMS = Irms linked to the analog output PACT= Active Power linked to the analog output COSFI= Power factor linked to the analog output Default: PACT
C3) IN STARTSCALE	Start Scale Measure linked to the output With this measure value the output will be at 0% Default: 0.0 W
C4) IN ENDSCALE	End Scale Measure linked to the output With this measure value the output will be at 100% Default: 9000.0 W
C5) OUTPUT TYPE	Analog output type: mA = Output in current mode

	V = Output in voltage mode Default: mA
C6) OUT STARTSCALE	Start Value for analog output (0%) when the input measure = IN STARTSCALE Default: 4.0 mA
C7) OUT ENDSCALE	End Value for analog output (100%) when the input measure = IN ENDSCALE Default: 20.0 mA

6.2.1. D) Counters

PARAMETER	VALUES
D1) Measure Unit	Active Energy measure unit: KWh MWh Wh mWh Default: KWh
D2) Digital Output function	Digital output mode: Pulse counter = Output mode in pulse mode, 1 pulse will be generated for every integer Measure unit Energy increment Energy sign = Output mode in sign mode (digital out high if active power is positive, digital output low if active power is negative) Default: Pulse counter
D3) Dig out ratio	If the Digital output mode is in “Pulse Counter mode” the digital output generate a pulse for every Dig out ratio integer value. For example: If Dig out ratio = 1 KWh the digital output will generate a pulse for every Kwh Energy increment If Dig out ratio = 100 KWh the digital output will generate a pulse for every 100Kwh

	Energy increment The value of 0.000 it's used when the digital output function it's in "Energy sign mode". Default: 1 KWh

6.2.1. E) Display

PARAMETER	VALUES
E1) LANGUAGE	Set the menu language: English Italiano Default: English
E2) DISPLAY MODE	Can set for the automatic cycle of all screen measures: Manual loop = Change the display screen by pressing OK/Menù for NEXT, ESC for PREVIOUS measure Automatic loop = Automatically change the screen measure (in this mode the screen page backup feature it's not available) Default: Manual Loop
E3) PASSWORD	Can be used for restrict the access to the menu by typing a password. NO = No password is required for access to the menù YES = The password 5477 is required for access to the menu Default: NO
D4) COUNT DIGOUT	When the digital output is in "pulse mode" the measure linked to the digital output can be: 3ph pos energy 3ph neg energy

	Pos energy A Pos energy B Pos energy C Neg energy A Neg energy B Neg energy C Default 3ph pos energy
D5) DIGOUT PHASE	When the digital output is in “sign mode” the Active Power sign linked to the digital output can be from: Phase A Phase B Phase C 3-phase Default: 3-phase
D6) DIGOUT LOGIC	Digital output logic can be: Normally open Normally close Default: normally open

6.2.1. F) User Taratures

PARAMETER	***VALUES***
F1) VOLT PHASE A	Set a multiplication factor for VRMS A Default: 1,000
F2) VOLT PHASE B	Set a multiplication factor for VRMS B Default: 1,000

F3) VOLT PHASE C	Set a multiplication factor for VRMS C Default: 1,000
F4) CURRENT PHASE A	Set a multiplication factor for IRMS A Default: 1,000
F5) CURRENT PHASE B	Set a multiplication factor for IRMS B Default: 1,000
F6) CURRENT PHASE C	Set a multiplication factor for IRMS C Default: 1,000

7. Energy Counters

The Energy Values are incremented independently:

Positive Energy Phase A

Positive Energy Phase B

Positive Energy Phase C

Negative Energy Phase A

Negative Energy Phase B

Negative Energy Phase C

The Others Energy ABC variables are obtained by the relations:

$$POS\ ENERGY\ ABC = POS\ ENERGY\ A + POS\ ENERGY\ B + POS\ ENERGY\ C$$

$$NEG\ ENERGY\ ABC = NEG\ ENERGY\ A + NEG\ ENERGY\ B + NEG\ ENERGY\ C$$

$$ENERGY\ ABC = POS\ ENERGY\ A - NEG\ ENERGY\ B$$

7.1. Energy counter overflow

The max value reached by each Energy variable counters is 9 999 999, 999 after that a new increment of 0,001 will reset the counter to 0,000.

7.2. Non volatile memory Energy backup

Only the following Energy variables are write on a non-volatile memory (using a Fe RAM technology):

- Integer part of phase A positive Energy
- Integer part of phase B positive Energy
- Integer part of phase C positive Energy
- Integer part of phase A negative Energy
- Integer part of phase B negative Energy
- Integer part of phase C negative Energy

The integer values are written every 1 second.

WARNING

Only the integer values are back-upped into the non-volatile memory so take care to the measure unit of the Energy.

- ***If the measure unit of Energy is Wh and the Energy ABC value is for example:***
  POS ENERGY ABC 567123.567 Wh
  only the integer value 567123 is back-upped, so when the module is switched on from a power down the error is 0.567 Wh

- ***if the measure unit of Energy is KWh and the Energy ABC value is for example:***
  POS ENERGY ABC 123456.789 KWh
  Only the integer value 123456 is back-upped so when the module is switched on from a power down the error is 0.789 KWh

8. Serial Communication

A models S203TA-D and S203RC-D feature it's the serial communication ability.

Two serial ports are available: a RS485 port and an USB port.

The RS485 port and USB port can't work both at the same time, the first byte received from the USB port will switch the communication from RS485 to USB.

After 5 seconds without a USB byte received the communication return to RS485.

The protocol supported for both ports is Modbus RTU slave, for more information about this protocol please refer to Modbus specification website:

http://www.modbus.org/specs.php

The default configuration for RS485 port is:

- Modbus station address: 1
- baud rate: 38400 baud
- parity: none
- data bit: 8
- stop bit: 1

The configuration for USB port is fixed and not configurable:

- Modbus station address: 1
- baud rate: 38400 baud
- parity: none
- data bit: 8
- stop bit: 1

8.1. Modbus RTU protocol

All registers are "Holding register" (Read Modbus function 3) with the convention that the first register is the 40001 address.

The following Modbus functions are supported:

Read Single Modbus Register (function 3)

Write Single Modbus Register (function 6)

Write Multiple Modbus Registers (function 16)

All values in 32bits are stored into 2 consecutive registers, for example:

VRMS A in floating point 32 bits is stored into registers 40135 and 40136, the Most significant word is the register 40135, the less significant word is the 40136.

So the 32bits value is obtained by the following relation:

$$VRMS\ A = Reg40136 + (Reg40135 \times 2^{16}) = Reg40136 + (Reg40135\ \times 65536)$$

8.1.1. Abbreviation used

In the following table this abbreviations are used:

“MS” = Most significant
“LS” = Less significant
“MSB” = Most significant Byte
“LSB” = Less significant Byte
“MSW” = Most significant Word (16 bits)
“LSW” = Less significant Word (16 bits)
“R” = Read only register
“RW” = Read and write register
“Unsigned 16 bits” = Unsigned 16 bits register
“Signed 16 bits” = 16 bits register with sign
“Float 32 bits” = Floating point single precision 32 bits (IEEE 754) register
“0x” = Hexadecimal Value

Default communication parameters, RS485: 38400 baud, 8N1.

Default communication parameters, USB: 38400 baud, 8N1.

8.1.2. Modbus Register Addresses

Register Name	Comment	Register Type	R/W	Default value or Start Value	Modbus Address
MachineID	Module ID code	Unsigned 16 bits	R	0x4F00	40001
Phase linked to analog output	Phase retransmitted in analog output: 0=phase A, 1=phase B, 2=phase C, 3=three phase	Unsigned 16 bits	RW	3	40017
CT Ratio	Current transformer numerator for CT ratio value (example: if this 32 bits register is 10.0, CT ratio is 10/5).	Float 32 bits	RW	5.0	40018(MS) 40019(LS)
StartScale IN	Start scale value for input in use. Default value depends on the selected type of input	Float 32 bits	RW	-1.0 for cosfi 0 others	40020(MS) 40021(LS)
EndScale IN	End scale value for input in use. Default value depends on the selected type of input	Float 32 bits	RW	Vrms = 600 V Irms = 5 A Active Energy = 9000 W Cosfi = 1	40022(MS) 40023(LS)
Line frequency compensation	Line Frequency fluctuation compensation: 0 = NO 1 = YES	Unsigned 16 bits	RW	0	40024
MB_Address	RS485 Modbus address value	Unsigned 8 bits	RW	1	40025 MSB (Bit [15:8])
Parity	RS485 Communication parity Parity: no parity=0 even = 1 odd=2	Unsigned 8 bits	RW	0	40025 LSB (Bit [2:0])
MB_Baudrate	RS485 Port baudrate value: 0x0000 = 4800; 0x0100= 9600; 0x0200 = 19200; 0x0300 = 38400; 0x0400 = 57600; 0x0500 = 115200; 0x0700 = 2400	Unsigned 16 bits	RW	0x0300 (38400 baud)	40026
Insertion type	0=ARON 1=4 wires 2=single phase	Unsigned 16 bits	RW	1	40027
Line frequency	Select the line frequency: 0=50 Hz, 1=60 Hz	Unsigned 16 bits	RW	0	40028
Modbus Stop Bits	Number of stop bits for modbus protocol (only for RS485 port) 0= 1 stop bit 1= 2 stop bits	Unsigned 16 bits	RW	0	40029
Measure linked To	0=VRMS, 1=IRMS, 2=Active power, 3=Cosfi	Unsigned 16 bits	RW	2	40030

analog output					
Start Scale OUTPUT	Start scale value for output in use.	Float 32 bits	RW	4.0 mA	40031(MS) 40032(LS)
End Scale OUTPUT	End scale value for output in use.	Float 32 bits	RW	20.0 mA	40033(MS) 40034(LS)
Digital output energy ratio	**0.0 = the digital output it's in "Energy sign configuration" (see the Display menu chapter)** Other values: Digital output make a pulse when energy has an increment of a given value of energy E. Default value is 1.0. Measure unit of the energy value is Wh, kWh, MWh, depending on the selected measure unit of "Energy ratio" register.	Float 32 bits	RW	1.0	40035(MS) 40036(LS)
Energy ratio	Configure measure unit of energy. to set Wh write 1 to set kWh write 1000 to set MWh write 1000000 etc…	Float 32 bits	RW	1000.0 (KWh)	40037(MS) 40038(LS)
Command aux 1	See Command register	-	W	0	40039
Command aux 2	See Command register	-	W	0	40040
TV ratio	Voltage transformer ratio value	Float 32 bits	RW	1.0	40041(MS) 40042(LS)
Phase linked to digital output	Selected phase to switch the digital output (if digout function is "energy sign configuration") 0=phase A, 1=phase B, 2=phase C, 3=three phase	Unsigned 16 bits	RW	3	40043
Type of module	0 = S203TA-D 1 = S203RC-D	Unsigned 16 bits	RW	0 for S203TA-D 1 for S203RC-D	40044
Digital Output Logic	Select the logic for digital output switching. 0 = Normally open 1 = Normally close	Unsigned 16 bits	RW	0	40047
Command	Command register. To reset the device, write ***0xDEAD*** To set a positive energy value for phase A, write the value ***(in integer unsigned 32 bits format)*** in Command aux 1 (high part) and command aux 2 (low part), then write ***0xBACA*** in Command register	Unsigned 16 bits	RW	0	40131

	To set a positive energy value for phase B, write the value ***(in integer unsigned 32 bits format)*** in Command aux 1 (high part) and command aux 2 (low part), then write ***0xBACB*** in Command register To set a positive energy value for phase C, write the value ***(in integer unsigned 32 bits format)*** in Command aux 1 (high part) and command aux 2 (low part), then write ***0xBACC*** in Command register To set a negative energy value for phase A, write the value ***(in integer unsigned 32 bits format, the firmware add itself the sign)*** in Command aux 1 (high part) and command aux 2 (low part), then write ***0xBACD*** in Command register To set a negative energy value for phase B, write the value ***(in integer unsigned 32 bits format, the firmware add itself the sign)*** in Command aux 1 (high part) and command aux 2 (low part), then write ***0xBACE*** in Command register To set a negative energy value for phase C, write the value ***(in integer unsigned 32 bits format, the firmware add itself the sign)*** in Command aux 1 (high part) and command aux 2 (low part), then write ***0xBACF*** in Command register				
Status	Bit 0 = communication error Bit 3 = Vrms > 45 V for phase A Bit 4 = Vrms > 45 V for phase B Bit 5 = Vrms > 45 V for phase C Bit 7 = Irms > cut off current for phase A Bit 8 = Irms > cut off current for phase B Bit 9 = Irms > cut off current	Unsigned 16 bits	R	0	40133

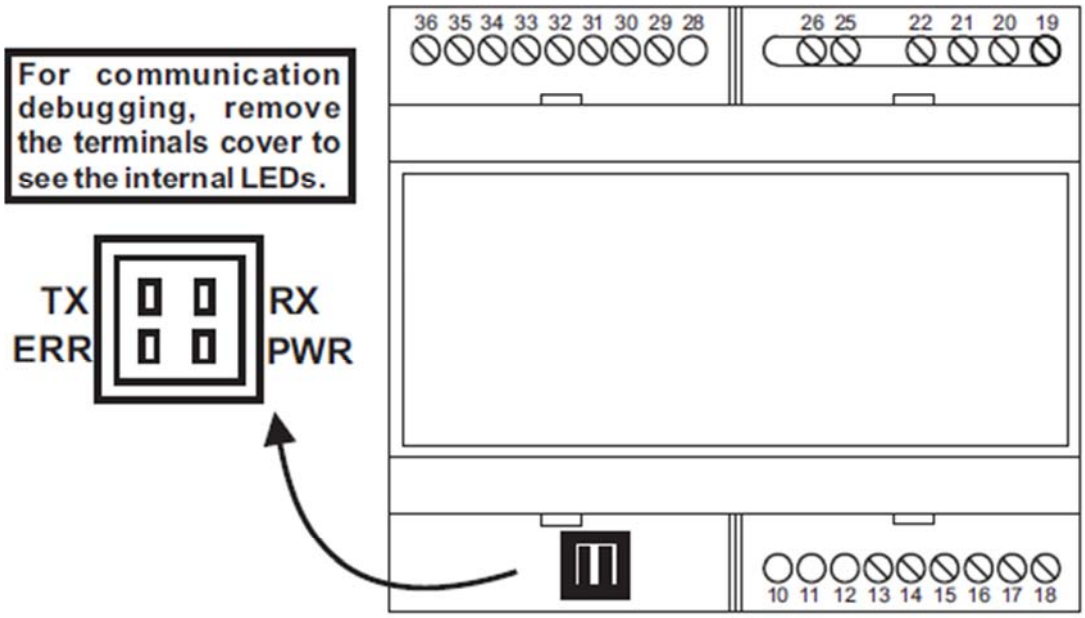
	for phase C Bit 15 = Feram error				
VRMS A	Voltage RMS measure for phase A, [Vrms]	Float 32 bits	R	0.0	40135(MS) 40136(LS)
VRMS B	Voltage RMS measure for phase B, [Vrms]	Float 32 bits	R	0.0	40137(MS) 40138(LS)
VRMS C	Voltage RMS measure for phase C, [Vrms]	Float 32 bits	R	0.0	40139(MS) 40140(LS)
VRMS ABC	Voltage RMS measure for 3-phase, [Vrms]	Float 32 bits	R	0.0	40141(MS) 40142(LS)
IRMS A	Current RMS measure for phase A, [mA rms]	Float 32 bits	R	0.0	40143(MS) 40144(LS)
IRMS B	Current RMS measure for phase B, [mA rms]	Float 32 bits	R	0.0	40145(MS) 40146(LS)
IRMS C	Current RMS measure for phase C, [mA rms]	Float 32 bits	R	0.0	40147(MS) 40148(LS)
IRMS ABC	Current RMS measure for phase 3-phase, [mA rms]	Float 32 bits	R	0.0	40149(MS) 40150(LS)
P ACTIVE A	Active power measure for phase A, [Watt]	Float 32 bits	R	0.0	40151(MS) 40152(LS)
P ACTIVE B	Active power measure for phase B, [Watt]	Float 32 bits	R	0.0	40153(MS) 40154(LS)
P ACTIVE C	Active power measure for phase C, [Watt]	Float 32 bits	R	0.0	40155(MS) 40156(LS)
P ACTIVE ABC	Active power measure for 3-phase, [Watt]	Float 32 bits	R	0.0	40157(MS) 40158(LS)
Q A	Reactive power measure for phase A, [VAR]	Float 32 bits	R	0.0	40159(MS) 40160(LS)
Q B	Reactive power measure for phase B, [VAR]	Float 32 bits	R	0.0	40161(MS) 40162(LS)
Q C	Reactive power measure for phase C, [VAR]	Float 32 bits	R	0.0	40163(MS) 40164(LS)
Q ABC	Reactive power measure for phase ABC, [VAR]	Float 32 bits	R	0.0	40165(MS) 40166(LS)
S A	Apparent power measure for phase A [VA]	Float 32 bits	R	0.0	40167(MS) 40168(LS)
S B	Apparent power measure for phase B [VA]	Float 32 bits	R	0.0	40169(MS) 40170(LS)
S C	Apparent power measure for phase C [VA]	Float 32 bits	R	0.0	40171(MS) 40172(LS)
S ABC	Apparent power measure for 3-phase, [VA]	Float 32 bits	R	0.0	40173(MS) 40174(LS)
CosFi A	Cosfi measure for phase A	Float 32 bits	R	0.0	40175(MS) 40176(LS)
CosFi B	Cosfi measure for phase B	Float 32 bits	R	0.0	40177(MS) 40178(LS)
CosFi C	Cosfi measure for phase C	Float 32 bits	R	0.0	40179(MS) 40180(LS)
CosFi ABC	Cosfi measure for phase ABC	Float 32 bits	R	0.0	40181(MS) 40182(LS)
Frequency	Frequency measure, in Hz (from phase A)	Float 32 bits	R	0.0	40183(MS) 40184(LS)
Energy A	Energy measure for phase A, measure unit depending on the selected measure unit (mWh, Wh, kWh, MWh)	Float 32 bits	R	0.0	40185(MS) 40186(LS)

Energy B	Energy measure for phase B, measure unit depending on the selected measure unit (mWh, Wh, kWh, MWh)	Float 32 bits	R	0.0	40187(MS) 40188(LS)
Energy C	Energy measure for phase C, measure unit depending on the selected measure unit (mWh, Wh, kWh, MWh)	Float 32 bits	R	0.0	40189(MS) 40190(LS)
Energy ABC	Energy measure for 3-phase, measure unit depending on the selected measure unit (mWh, Wh, kWh, MWh)	Float 32 bits	R	0.0	40191(MS) 40192(LS)
Screen Display mode	1=auto change screen page 0=manual change screen page	Unsigned 16 bits	RW	0	40222
Display menù Language	Language of items displayed: 1=italiano 0=english	Unsigned 16 bits	RW	0	40223
Start scale INPUT for VRMS (analog output)	Start scale for input, with reference to the analog output [V]	Float 32 bits	RW	0.0	40505(MS) 40506(LS)
Start scale INPUT for IRMS (analog output)	Start scale for input, with reference to the analog output [A]	Float 32 bits	RW	0.0	40507(MS) 40508(LS)
Start scale INPUT for P ACTIVE (analog output)	Start scale for input, with reference to the analog output [W]	Float 32 bits	RW	0.0	40509(MS) 40510(LS)
Start scale INPUT for COSFI (analog output)	Start scale for input, with reference to the analog output [W]	Float 32 bits	RW	-1.0	40511(MS) 40512(LS)
End scale INPUT for VRMS (analog output)	End scale for input, with reference to the analog output retransmission [V]	Float 32 bits	RW	600.0	40513(MS) 40514(LS)
End scale INPUT for IRMS (analog output)	End scale for input, with reference to the analog output retransmission [A]	Float 32 bits	RW	5.0	40515(MS) 40516(LS)
End scale IN for PACT (analog output)	End scale for input, with reference to the analog output retransmission [W]	Float 32 bits	RW	9000.0	40517(MS) 40518(LS)
End scale IN for COSFI (analog output)	End scale for input, with reference to the analog output retransmission	Float 32 bits	RW	1.0	40519(MS) 40520(LS)
Digital out counter configuration	Select the digital output retransmission between: Digital output positive energy,	Unsigned 16 bits	RW	6	40521

	phase A (write “0”) Digital output positive energy, phase B (write “1”) Digital output positive energy, phase C (write “2”) Digital output negative energy, phase A (write “3”) Digital output negative energy, phase B (write “4”) Digital output negative energy, phase C (write “5”) Digital output positive energy, threephase (write “6”) Digital output negative energy, threephase (write “7”)				
User tarature – current for phase A	User Tarature coefficient for phase A current	Float 32 bits	RW	1.0	40524(MS) 40525(LS)
User tarature – current for phase B	User Tarature coefficient for phase B current	Float 32 bits	RW	1.0	40526(MS) 40527(LS)
User tarature – current for phase C	User Tarature coefficient for phase C current	Float 32 bits	RW	1.0	40528(MS) 40529(LS)
User tarature – voltage for phase A	User Tarature coefficient for phase A voltage	Float 32 bits	RW	1.0	40530(MS) 40531(LS)
User tarature – voltage for phase B	User Tarature coefficient for phase B voltage	Float 32 bits	RW	1.0	40532(MS) 40533(LS)
User tarature – voltage for phase C	User Tarature coefficient for phase C voltage	Float 32 bits	RW	1.0	40534(MS) 40535(LS)
Firmware code	Device Firmware code	Unsigned 16 bits	R	-	40901
Output type	Type for analog output: 0 = Voltage Output 1 = Current Output	Unsigned 16 bits	RW	1	40921
Phase A pos energy	Sum of energy for phase A (only positive)	Float 32 bits	R	0.0	40942 (MS) 40943 (LS)
Phase A neg energy	Sum of energy for phase A (only negative)	Float 32 bits	R	0.0	40944 (MS) 40945 (LS)
Phase B pos energy	Sum of energy for phase B (only positive)	Float 32 bits	R	0.0	40946 (MS) 40947 (LS)
Phase B neg energy	Sum of energy for phase B (only negative)	Float 32 bits	R	0.0	40948 (MS) 40949 (LS)
Phase C pos energy	Sum of energy for phase C (only positive)	Float 32 bits	R	0.0	40950 (MS) 40951 (LS)
Phase C neg energy	Sum of energy for phase C (only negative)	Float 32 bits	R	0.0	40952 (MS) 40953 (LS)
3-phase pos energy	Sum of energy for three phases (only positive)	Float 32	R	0.0	40954 (MS) 40955 (LS)

		bits			
3-phase neg energy	Sum of energy for three phases (only negative)	Float 32 bits	R	0.0	40956 (MS) 40957 (LS)

9. DEBUG LEDs


For communication debugging, remove the terminals cover to see the internal LEDs.
TX
RX
ERR
PWR
36 35 34 33 32 31 30 29 28
26 25
22 21 20 19
10 11 12 13 14 15 16 17 18

LED	LED status	Meaning
PWR	Constant light	The module power is on
ERR	Constant light	Measure of voltage: <45Vac (at least one of the phases used)
RX	Blinking light	The module received a data packet from RS485
TX	Blinking light	The module sent a data packet to the RS485

10. THE KIT-USB

The KIT-USB can be obtained from (Can be bought also from the E-commorce Website)

The kit contain:

- A CD with the USB drivers for Windows and the Easy Setup software
- A standard mini-B USB Cable

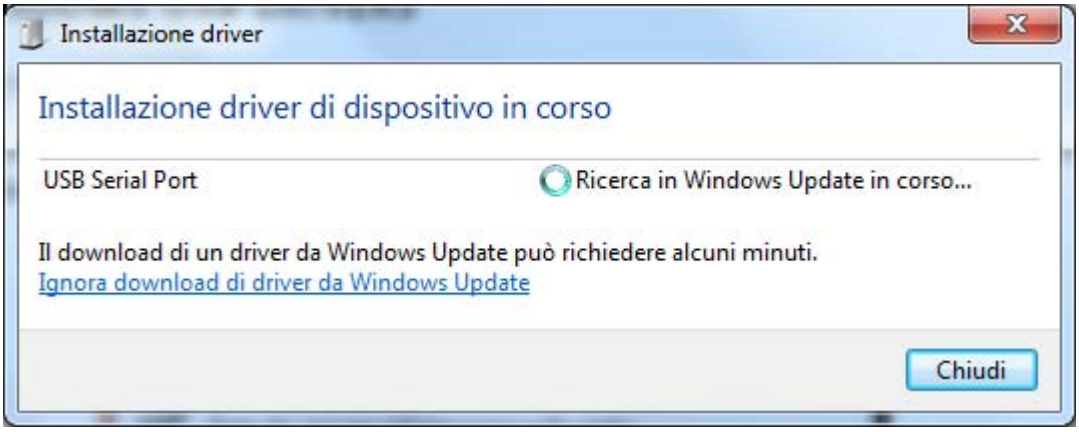
11. WINDOWS USB DRIVERS INSTALLATION

For installing the USB drivers follow this procedure:

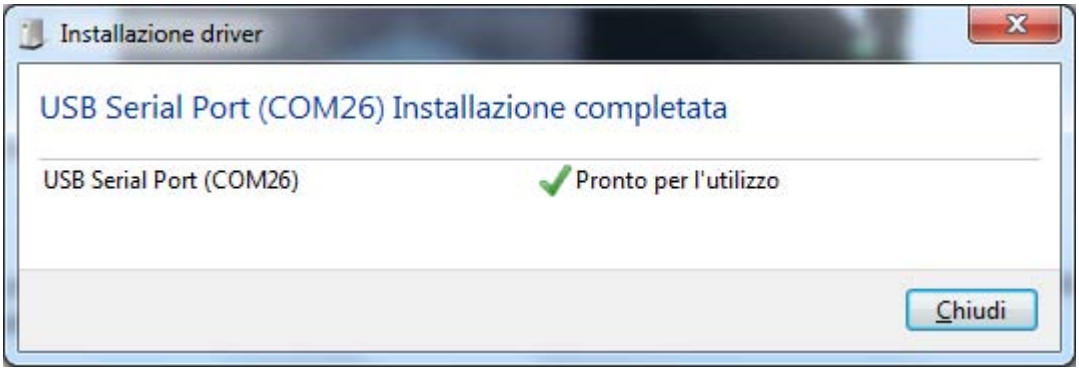
- Power up the S203TA-D / S203RC-D and connect the USB to the PC, the new hardware it's detected:

- If you don't have an internet connection insert the CD and install the FTDI driver or download the drivers from the website http://www.ftdichip.com/Drivers/VCP.htm

- If you have an internet connection the driver is automatically searched into the Windows Update database:


Installazione driver
Installazione driver di dispositivo in corso
USB Serial Port
Ricerca in Windows Update in corso...
Il download di un driver da Windows Update può richiedere alcuni minuti.
Ignora download di driver da Windows Update
Chiudi

- After 3-4 minutes the driver is installed and the USB (USB Serial Port) is ready to use :



12. OTHERS OPERATING SYSTEM DRIVERS:

From the website:

http://www.ftdichip.com/Drivers/VCP.htm

it's possible to download the USB drivers for others Operating System like:

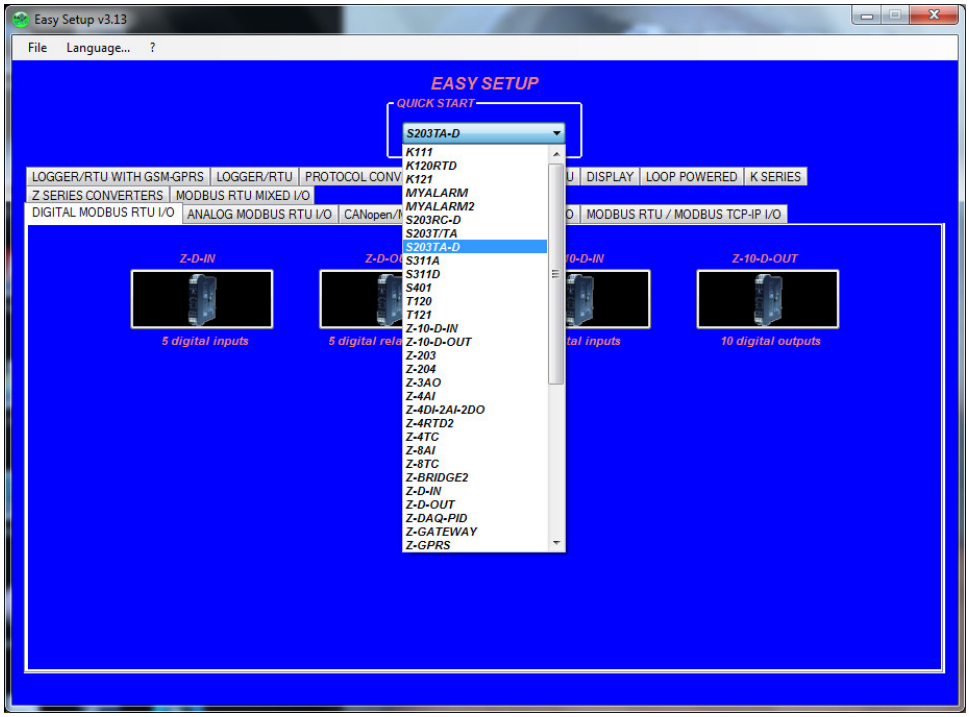
Windows xp, Vista, Windows 8
Linux
MAC OS
Windows CE

13. EASY SETUP SOFTWARE for Windows

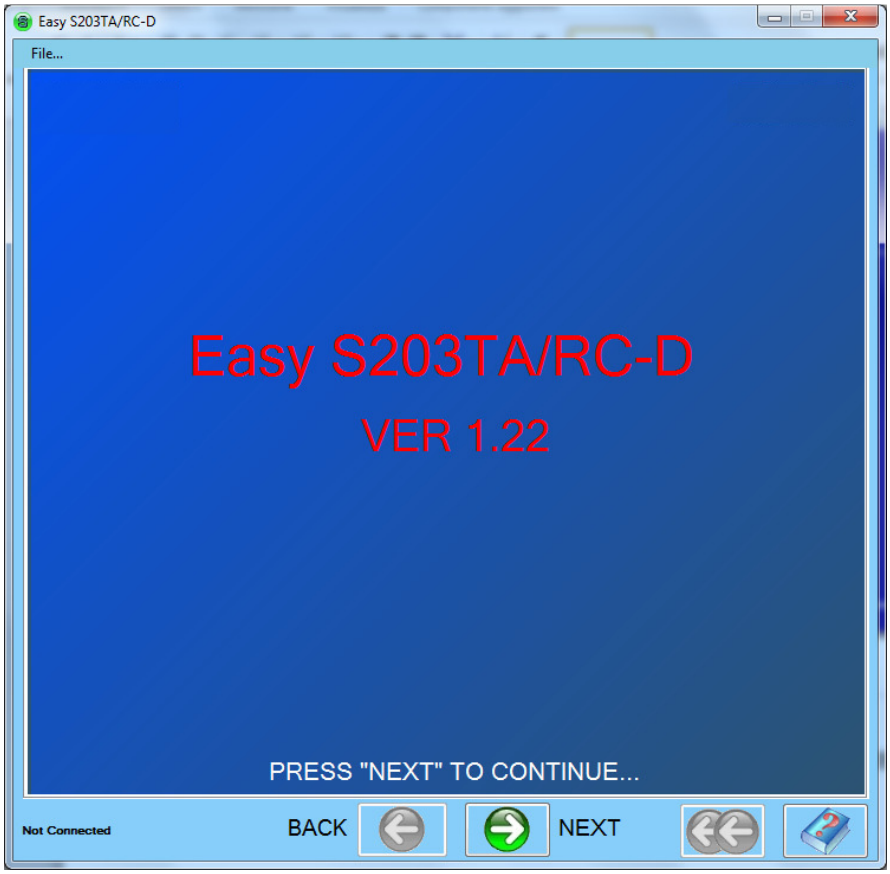
If you want to configure the S203TA/RC-D by the USB you must FIRST install the USB drivers (see chapter 11).

Extract the zip file and double click on the Setup file for install the software.

From the Quick Start menu select the S203TA-D or S203RC-D model (you can also click on the tab “Analog Modbsu RTU I/O” and select the S203TA-D or S203RC-D button).



Now the configuration software “Easy S203TA/RC-D” starts:


Easy S203TA/RC-D
File...
Easy S203TA/RC-D
VER 1.22
PRESS "NEXT" TO CONTINUE...
Not Connected
BACK
NEXT

Press “Next”:

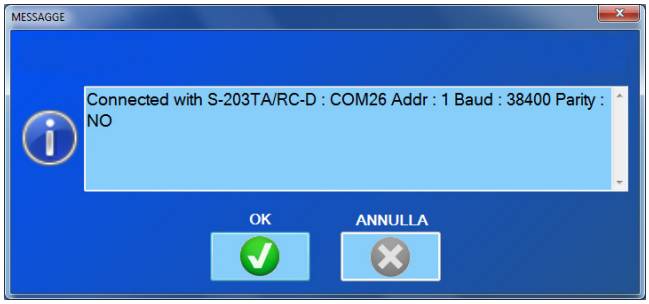
Easy S203TA/RC-D
File...
DEVICE CONNECTION
CONNECT THE DEVICE TO THE PC WITH A USB CABLE OR USING A RS485 CONVERTER (S107USB)
GND
Tx
Rx
Pwr
S117P
SEARCH MODE
AUTOMATIC SEARCH
MANUAL SEARCH
NO SEARCH
Not Connected
BACK
NEXT

If you have previously installed the USB drivers connect the USB cable to the PC , also use a RS485 to USB converter like S117P1.

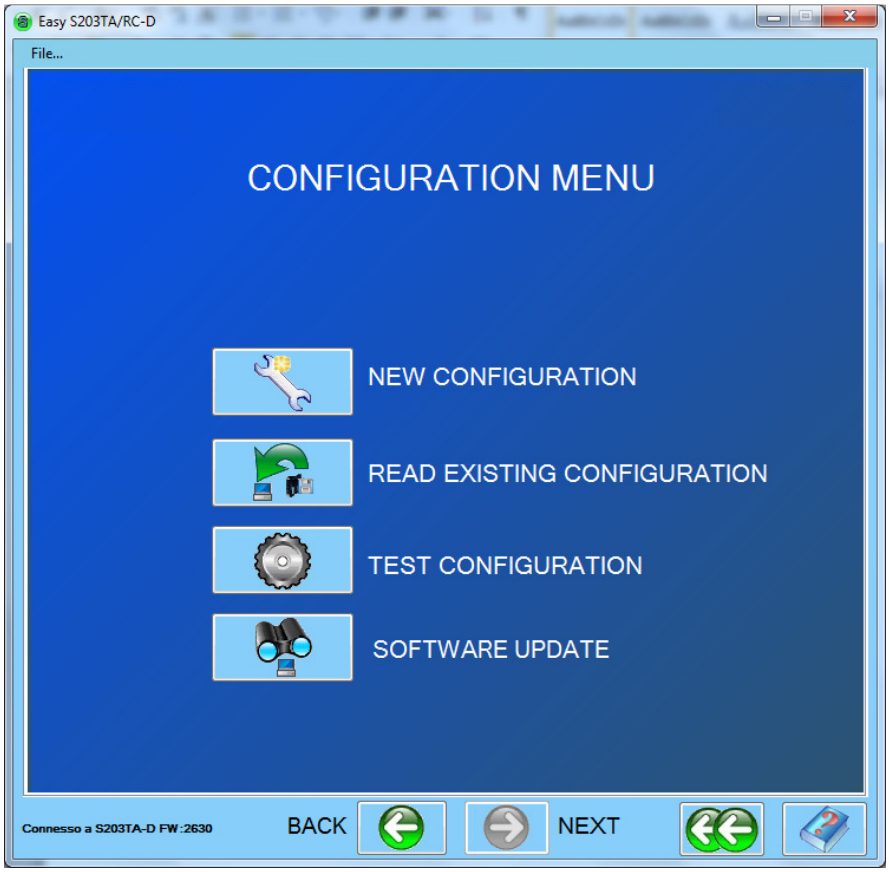
Although RS485 to USB converters can be used only RS485 to USB converters are tested to work with S203TA/RC-D.

Click on “AUTOMATIC SEARCH” for automatic connection to the S203TA/RC-D.

The software try to connect with all the serial ports until the S203TA/RC-D will answer:



Now the configuration menu will be displayed:



13.1. Firmware Update

With a new revision of Easy Setup, Logicbus can include a new S203TA/RC-D firmware.

A new firmware update can include new features or bugfix.

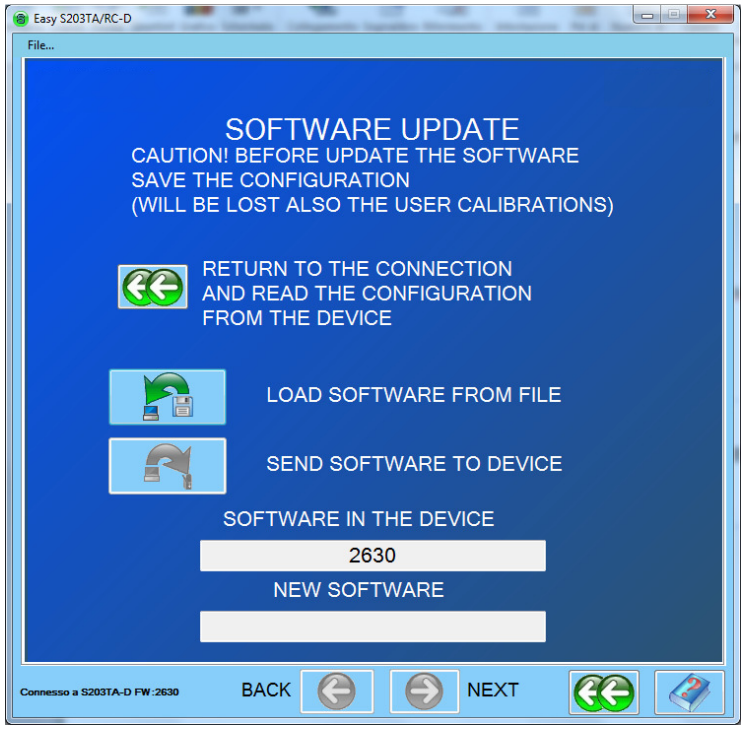
WARNING!

When the firmware update it's started don't power down the S203TA/RC-D until all the procedure it's finished.

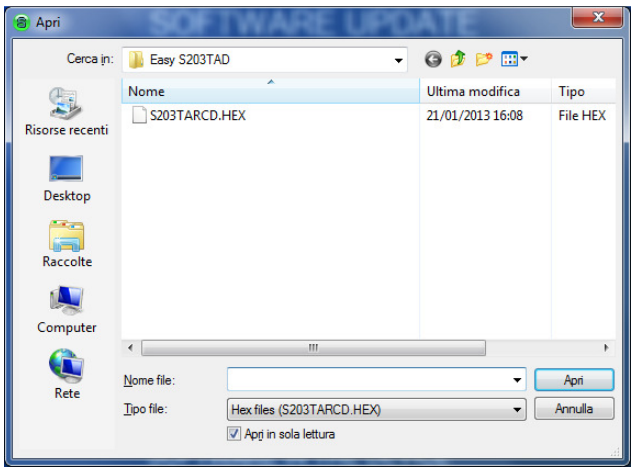
Power ON the S203TA/RC-D and connect it to the PC (see chapter 13)

On the configuration menu click on "Software update"

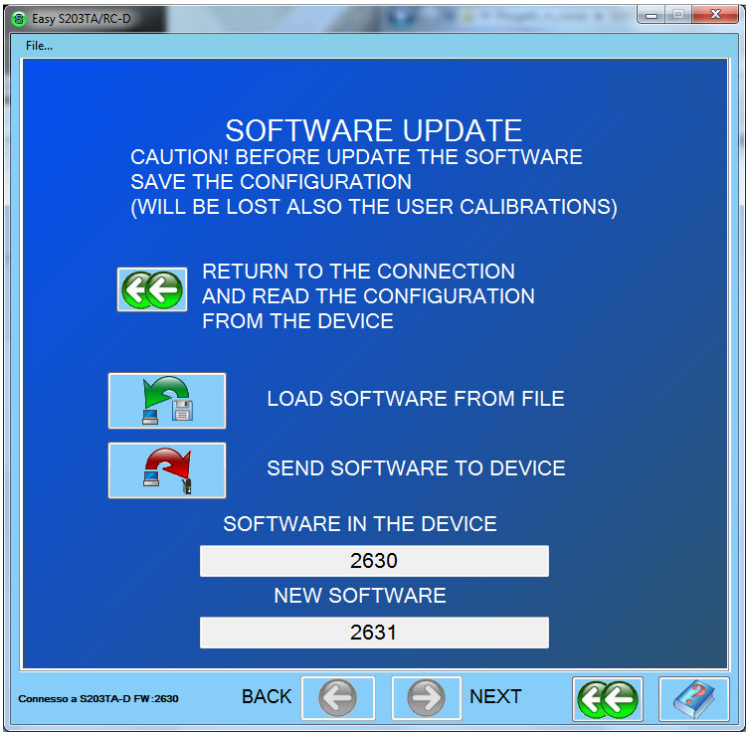
On the S203TA/RC-D display will be displayed: "UPDATING… PLEASE WAIT…" so the module is in bootloader mode



Press the “Load software from file”, the software will open directly the firmware directory.



If the “new software” revision is newer the “software in the device” revision click on “Send software to the device”



The firmware update take about 1 minute.